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U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

APPEAL BRIEF TRANSMITTAL		Docket Number: **10191/2175**	Conf. No. **6461**
Application Number **10/030,586**	Filing Date **May 24, 2002**	Examiner **Davis D. HWU**	Art Unit **3752**
Invention Title **FUEL INJECTOR**		Inventor **Hans LANDER et al.**	

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Date: 5/10, 2005 Reg. No. 36,197

Signature: _____
Jong H. Lee

Further to the Notice of Appeal dated January 6, 2005 (filed on January 10, 2005) for the above-referenced application, enclosed are three copies of an Appeal Brief. Accompanying the Appeal Brief is the Appendix to the Appeal Brief.

The Commissioner is hereby authorized to charge payment of the 37 C.F.R. § 41.20(b)(2) appeal brief filing fee of **$500.00**, a two-month extension fee of **$450.00**, and any additional fees associated with this communication to the deposit account of **Kenyon & Kenyon**, deposit account number **11-0600**.

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[10191/2175]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant(s)	:	Hans LANDER et al.
Application. No.	:	10/030,586
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APPENDIX TO APPELLANTS' APPEAL BRIEF
UNDER 37 C.F.R. § 41.37

S I R :

The claims involved in this appeal, claims 16-25, in their current form after entry of all amendments presented during the course of prosecution, are set forth below:

APPEALED CLAIMS:

16. A fuel injector for use in projecting directly into a combustion chamber of an internal combustion engine, the fuel injector comprising:

a fuel inlet;

a movable valve-closure member;

a fixed valve seat to cooperate with the valve-closure member to open and close a valve; and

a downstream valve end including a component and a fuel outlet, wherein:

the fuel outlet includes at least one discharge orifice of the component,

the at least one discharge orifice is arranged downstream of the fixed valve seat,

the component includes a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice, and

the coating includes a layer containing fluorine.

17. The fuel injector of claim 16, wherein the layer containing fluorine includes fluorosilicate (FAS).

18. The fuel injector of claim 16, wherein the layer containing fluorine includes a heat-resistant PTFE-similar layer.

19. The fuel injector of claim 16, wherein the internal combustion engine includes an externally supplied ignition.

20. The fuel injector of claim 16, wherein the internal combustion engine includes an auto-ignition.

21. The fuel injector of claim 16, wherein the coating is provided in a ring shape around the at least one discharge orifice on a downstream exterior surface of the component.

22. The fuel injector of claim 16, wherein the coating is provided over an entire surface of a downstream exterior surface of the component.

23. The fuel injector of claim 21, wherein the coating extends into the at least one discharge orifice.

24. The fuel injector of claim 16, wherein the layer containing fluorine is appliable by spraying.

25. The fuel injector of claim 22, wherein the coating extends into the at least one discharge orifice.

Respectfully submitted,

KENYON & KENYON

Dated: 5/10, 2005

By: [signature] (by [signature] R. No. 36,197)

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[10191/2175]

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APPELLANTS' APPEAL BRIEF
UNDER 37 C.F.R. § 41.37

S I R :

Applicants filed a Notice of Appeal dated January 6, 2005 (filed at the PTO on January 10, 2005), appealing from the Final Office Action dated September 10, 2004, in which claims 16-25 of the above-identified application were finally rejected. This Brief is submitted by Applicants in support of their appeal.

I. REAL PARTIES IN INTEREST

The above-identified Applicants and Robert Bosch GmbH of Stuttgart, Germany, are the real parties in interest.

II. RELATED APPEALS AND INTERFERENCES

No appeal or interference which will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal is known to exist to the undersigned attorney or is believed by the undersigned attorney to be known to exist to Applicants.

III. STATUS OF CLAIMS

Claims 16-25 are pending in this application and under consideration in this Appeal. Among the claims presently on appeal, claim 16 is independent, and claims 17-25 are ultimately dependent on claim 16.

IV. STATUS OF AMENDMENTS

No amendment has been made subsequent to the final Office Action mailed on September 10, 2004.

V. SUMMARY OF THE INVENTION

Figure 2 shows a cross-section of an exemplary fuel injector 5 according to the present invention. (Substitute specification, p. 3, l. 22-23). An electromagnetically operable valve, which has a tubular, largely hollow-cylindrical core 11 that is at least partially surrounded by a magnetic coil 10, is used as the internal pole of a magnetic circuit. (P. 3, l. 23-27). For example, a graded plastic coil form 13 receives a winding of magnetic coil 10 and, in conjunction with core 11 and a non-magnetic intermediate part 14 partially surrounded by magnetic coil 10, permits a particularly compact and short injector in the area of magnetic coil 10. (P. 3, l. 27-31). Instead of the electromagnetic actuating element, fuel injector 5 may also be actuated in a piezoelectric or magnetostrictive manner. (P. 3, l. 31-34).

Provided in core 11 is a traversing longitudinal opening 15, which extends along a longitudinal valve axis. (P. 3, l. 36 - p. 4, l. 2). Core 11 of the magnetic circuit also serves as intake nipple 7. (P. 4, l. 2-3). Fixedly joined to core 11 above magnetic coil 10 is an outer metallic (such as, for example, ferritic) housing part 16 which, as an external pole or an outer conductive element, closes the magnetic circuit and completely surrounds magnetic coil 10, at least in the circumferential direction. (P. 4, l. 3-7). Provided in the longitudinal opening 15 of core 11 on the intake side is a fuel filter 17 that filters out fuel components that, because of their size, may cause clogging or damage to the injector. (P. 4, l. 8-11).

Joined imperviously and fixedly to upper housing part 16 is a lower tubular housing part 18 which, for example, may enclose or receive an axially movable valve part including an armature 19, a bar-shaped valve needle 20 and an elongated valve-seat support 21. (P. 4, l. 13-17). Both housing parts 16 and 18 may be permanently joined to one another by, for example, a circumferential welded seam. (P. 4, l. 17-19). The sealing between housing part 18 and valve-seat support 21 may be effected, for example, by a sealing ring 22 (P. 4, l. 19-21). Valve-seat support 21 includes, over its entire axial extension, an inner through hole 24 that runs concentrically with respect to the longitudinal valve axis (P. 4, l. 21-23).

With its lower end, which also functions as the downstream termination of entire fuel injector 5, valve-seat support 21 surrounds a disk-shaped valve-seat element 26, fitted into through hole 24, including a valve-seat surface 27 tapering frustoconically downstream. (P. 4, l. 25-29). Arranged in through hole 24 is valve needle 20, which has a valve-closure section 28 at its downstream end. (P. 4, l. 29-31). This, for example, spherical, partially ball-shaped and conically tapering valve-closure section 28 cooperates with valve-seat surface 27 provided in valve-seat element 26. (P. 4, l. 31-34). Downstream of valve-seat surface 27, at least one discharge orifice 32 for the fuel is introduced in valve-seat element 26. (P. 4, l. 34-36).

A guide opening 34 provided in valve-seat support 21 at the end facing armature 19 and a disk-shaped guide element 35 arranged upstream of valve-seat element 26 and including a dimensionally accurate guide opening 36 are used for guiding valve needle 20 during its axial movement with armature 19 along the longitudinal valve axis. (P. 5, l. 1-6).

The guide and seat area provided in the end of valve-seat support 21 on the spray-discharge side is formed in its through hole 24 by three axially sequential, disk-shaped, functionally-separate elements. (P. 5, l. 28-31). Guide element 35, a swirl element 47 and valve-seat element 26 follow one another in the downstream direction. (P. 5, l. 31-33). A compression spring 50 enclosing valve needle 20 secures guide element 35, swirl element 47 and valve-seat element 26 in place in valve-seat support 21. (P. 5, l. 33-35).

During motorized operation, in the case of direct injection of a fuel into the combustion chamber of an internal combustion engine, the problem may occur that the downstream tip of the injector projecting into the combustion chamber may get coked by fuel deposits (that is to say, soot particles in the flame front may deposit on the valve tip). (P. 6, l. 10-15). Thus, for injectors projecting into the combustion chamber, the danger of a negative influencing of the spray parameters (such as, for example, static flow amount, spray dispersal angle, drop size, skeining ability) exists over the service life of the injectors, which may lead to disturbances in the running of the internal combustion engine, up to a failure of the injectors. (P. 6, l. 15-22).

According to an exemplary embodiment of the present invention, the aforesaid problem is reduced or eliminated by applying coatings at valve end 8. (P. 6, l. 24-26). In this context, different effects on surface 54 of the component to be coated, such as, for example, on

valve-seat element 26 made of Cr-steel, may be attained by different coatings. (P. 6, l. 26-29).

Catalytically acting layers may form a first group of coatings. (P. 6, l. 36-37). The electrolytically applied layers may provide for a catalytic conversion (burning) of the deposited soot particles or prevent the deposit of carbon particles. (P. 6, l. 37 - p. 7, l. 2). Suitable materials for such a coating to avoid coking may be cobalt, nickel oxides and oxides of alloys of these metals. (P. 7, l. 2-4) The noble metals Ru, Rh, Pd, Os, Ir and Pt, and alloys of these metals, among themselves or with other metals, may also exhibit catalytic effectiveness. (P. 7, l. 4-7). The desired layers may be produced, for example, by electrochemical or external-currentless metal deposition. (P. 7, l. 7-9). In the case of Ni, Co or their alloys, oxide formation in air or an additional oxidation step (using a wet chemical treatment, plasma) may also be used. (P. 7, l. 9-11).

Coatings with which wetting properties on corresponding surface 54 may be changed, form a second large group of coatings. (P. 7, l. 13-15). These coatings may reduced the surface energy and/or the surface roughness of critical regions at valve end 8. (P. 7, l. 15-16). The interfacial energy between surface 54 and the fuel may thereby be increased, which causes the wetting to deteriorate. (P. 7, l. 16-18). In this way, the fuel drops at the regions coated according to an exemplary embodiment of the present invention may be able to drip off and may be entrained by the surrounding flow at valve end 8. (P. 7, l. 18-22). Permanent wetting of valve end 8 may no longer take place. (P. 7, l. 22-23). Such layers may be ceramic coatings, carbon coatings, which may be metal-containing or metal-free, or fluorine-containing coatings. (P. 7, l. 23-25). The fluorine-containing coatings may be, for example, heat-resistant PTFE-similar coatings or, in particular, organic ceramic coatings or so-called Ormocer® coatings made of fluorosilicate (FAS). (P. 7, l. 25-28). For example, such fluorine-containing coatings may be applied by spraying or dipping. (P. 7, l. 28-30). Sapphire coatings may also be applied. (P. 7, l. 30).

A third group of coatings may be formed, with which a reaction layer may be prevented. (P. 7, l. 32-33). Coatings for this third group may be, for example, nitrite layers (TiN, CrN) or oxide layers (tantalum oxide, titanium oxide). (P. 7, l. 33-35). Similar to sputtering, for these layers, particles vaporized in a vacuum furnace may be deposited on surfaces 54 to be coated. (P. 7, l. 35-37).

The regions to be coated at valve end 8 are, in particular, those that immediately surround the at least one discharge orifice 32 in its outlet area 55, since, a deposit of soot particles in discharge orifice 32 and/or at its immediate boundary edge may lead, in particular, to the disadvantageous influencing of the spray parameters (such as, for example, static flow quantity, spray dispersal angle, drop size, skeining ability) indicated above. (P. 8, l. 1-8). Thus, a coating should be applied at the downstream end (outlet area 55) of each individual discharge orifice 32, regardless of on which component of fuel injector 5 discharge orifice 32 may be formed. (P. 8, l. 8-12).

Figures 3 and 4 show bottom views of two exemplary embodiments of valve ends 8 coated according to an exemplary embodiment of the present invention. (P. 8, l. 14-16). In Figure 3, entire downstream component surface 54 of the component including discharge orifice 32, shown in Figure 3 as valve-seat element 26, is coated. (P. 8, l. 16-19). In Figure 4, only an annular partial area of downstream component surface 54 is coated around the at least one discharge orifice 32. (P. 8, l. 19-21). The dotted areas show the coated regions. (P. 8, l. 21-22). In Figures 3 and 4, outlet areas 55 of discharge orifices 32 lie in the drawing plane (not shown). (P. 8, l. 22-23). The coatings may also extend slightly into discharge orifice 32. (P. 8, l. 23-24).

In the exemplary embodiments of Figures 3 and 4, valve-seat element 26 is the component of fuel injector 5 that forms downstream end 8

and has discharge orifice 32, so that the coating is applied at downstream end face 54 of valve-seat element 26. (P. 8, l. 26-30). However, the application of a coating is not limited to a valve-seat element, but rather other valve components that form downstream valve end 5 and thus project into combustion chamber 3 may also include such a coating. (P. 8, l. 30-33). For such components arranged downstream of valve seat 27 (see spray-discharge member 67 in Figure 5), as well, at least the regions immediately at discharge orifices 32 should be coated, so that the actual spray-discharge area may be protected from coking. (P. 8, l. 33 - p. 9, l. 2).

Figure 5 shows an alternative guide and seat region at valve end 8 on the spray-discharge side, to show that an exemplary coating according to the present invention may also be applicable to valve designs that differ structurally. (P. 9, l. 4-7). In the exemplary embodiment of Figure 5, a further disk-shaped spray-discharge member 67 is arranged downstream of valve-seat element 26. (P.9, l. 7-10). In this case, spray-discharge member 67 includes discharge orifice 32. (P. 9, l. 10-11). Discharge orifice 32 is inclined at an angle with respect to the longitudinal valve axis and terminates downstream in a convexly curved spray-discharge region 66. (P. 9, l. 11-14). For example, the coating may be applied over entire curved spray-discharge region 66 or directly in a ring shape about outlet area 55 of discharge orifice 32, so that, relative to the longitudinal valve axis, an off-center coating may exist on curved surface 54. (P. 9, l. 19-24).

Figure 6 shows a longitudinal cross section through a fuel injector for auto-ignition internal combustion engines, particularly diesel engines, only the part facing the combustion chamber being shown. (P. 9, l. 26-29). An enlargement of the end of fuel injector 5 on the combustion chamber side shown in Figure 6 is shown in Figure 7. (P. 9, l. 29-31). Valve member 72 is braced against a valve-retaining member 73 by a tension nut 75. (P. 9, l. 31-32). Formed in valve member 72 is a bore 84, in which piston-shaped valve needle 20 is arranged, which is axially movable against a closing force. (P. 9, l. 32-34). Bore 84 is implemented as a blind-end bore,

the closed end of the bore 84 facing combustion chamber 3, forming a valve-seat surface 27 that has a truncated cone shape. (P. 9, l. 35-37). Due to a bulge of the end of valve-seat surface 27 on the combustion chamber side, a blind hole 92 is formed, in whose wall at least one discharge orifice 90 is configured that connects blind hole 92 to combustion chamber 3. (P. 9, l. 37 - p. 10, l. 4).

Formed on valve needle 20 at the end on the combustion chamber side is a valve-sealing surface 88, forming valve-closure section 28 (not shown in Figure 6 or Figure 7), which cooperates with valve-seat surface 27 so that the at least one discharge orifice 90 is sealed against pressure space 86 by the contact of valve-sealing surface 88 on valve-seat surface 27. (P. 10, l. 23-29). Due to the opening lift movement directed inwardly away from combustion chamber 3, valve-sealing surface 88 lifts off of valve-seat surface 27 and connects pressure space 86 to discharge orifice 90. (P. 10, l. 29-32).

The catalytically active coating may be applied, for example, over the entire end face of valve member 72 facing combustion chamber 3. (P. 10, l. 34-36). Further, only curved outer surface 96 of blind hole wall 93 may be provided, which borders blind hole 92 and in which the at least one discharge orifice 90 is formed, with a coating. (P. 10, l. 36 - p. 11, l. 2). Provision may also be made to continue the coating into discharge orifice 90. (P. 11, l. 2-3).

VI. GROUNDS OF REJECTION TO BE REVIEWED

The following grounds of rejection are presented for review on appeal in this case:

(A) Whether claims 16, 19 and 21-25 are rendered obvious under 35 U.S.C. § 103(a) by U.S. Patent No. 5,544,816 ("Nally"") in view of U.S. Patent No. 4,995,949 ("Rhoades").

(B) Whether claim 17 is rendered obvious under 35 U.S.C. § 103(a) by U.S. Patent No. 5,544,816 ("Nally") in view of U.S. Patent 4,995,949

("Rhoades") and Soviet Union Published Patent Application No. 775364B ("Fedorovich").

(C) Whether claim 18 is rendered obvious under 35 U.S.C. § 103(a) by Nally in view of Rhoades and U.S. Patent No. 4,620,995 ("Otomo").

(D) Whether claim 20 is rendered obvious under 35 U.S.C. § 103(a) by Nally in view of Rhoades and U.S. Patent No. 4,397,283 ("Komaroff").

VII. GROUPING OF CLAIMS

For each ground of rejection, all claims subject to the rejection will be argued as a single group, with the exception of claims 21 and 22, which will be argued separately (in addition to the arguments pertaining to the overall group of rejected claims 16, 19 and 21-25).

VIII. ARGUMENTS

A. Rejection of Claims 16, 19 and 21-25 Under 35 U.S.C. § 103(a)

i. Arguments Pertaining to Claims 16, 19 and 21-25

Claims 16, 19 and 21-25 were rejected under 35 U.S.C. § 103(a) as unpatentable over Nally (U.S. Patent No. 5,544,816) in view of Rhoades (U.S. Patent No. 4,995,949). Applicants respectfully submit that claims 16, 19 and 21-25 are patentable over the combination of Nally and Rhoades for the following reasons.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d

488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

Independent claim 16 recites a "fuel injector for use in projecting directly into a combustion chamber of an internal combustion engine, the fuel injector including . . . a downstream valve end including a component and a fuel outlet, wherein the fuel outlet includes at least one discharge orifice of the component, . . . the component includes a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice, and the coating includes a layer containing fluorine." While the Examiner conceded in the 2/25/04 Office Action that "**Nally et al. do not disclose the component including a coating as recited,**" the Examiner also asserted that Rhoades "teaches a method of making a fuel injector in which the fuel injector comprises discharge orifices which are coated with PTFE which contains fluorine in order to attain precise flow resistance." The Examiner concluded that it would have been obvious "to have modified the device of Nally et al. by providing a coating comprising PTFE around the at least one discharge orifice as taught by Rhoades in order to attain precise flow resistance." Furthermore, in response to Applicants' argument that "Rhoades relates to methods of finishing the ***inner surface*** of orifices, and Rhoades simply does not teach or suggest coating of an immediate exterior of an outlet area of the orifice, as recited in claim 16," (5/25/04 Amendment), the Examiner contended that "**in finishing the entire inner surface of an orifice, the coating will extend to the edge radius of the outlet of the orifice in which the edge radius of the outlet of the orifice can be considered to be an immediate exterior of an outlet area of the at least one discharge orifice.**" (9/10/04 Office Action).

Initially, Applicants note that Rhoades clearly fails to explicitly disclose or suggest "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one

discharge orifice," as recited in claim 16. Rhoades relates generally to "electrochemical, chemical or electrical discharge machining (material removing techniques) or plating or coating (material building techniques) upon a part to provide a constant, predetermined rate of flow of the ***processing fluid used in said machining, plating or coating process***, through an orifice, where the dynamic rate of the processing fluid is directly related to the target rate of flow through the orifice of the fluid of ultimate intended use." (Col. 3, l. 53-62). Rhodes specifically notes that "electrochemical, chemical and electrical discharge machining are widely employed . . . for machining and finishing operations on **internal shapes**, bores, apertures, complex three dimensional shapes, and other difficult operations." (Col. 4, lines 44-49). As disclosed in Rhoades, the flow resistance is controlled by controlling the orifice geometry (e.g., length and diameter); however, a precise control of the geometry to the tolerance required in some applications is very difficult, if not impossible, with conventional fabrication techniques. (Col.1, lines 14-19). The method of Rhoades starts instead with an orifice that is substantially oversized or undersized. (Col.10, lines 46-53). For an oversized orifice, electroplating and similar processes are used to *reduce* the diameter; for an undersized orifice, chemical machining and similar processes are used to *increase* the diameter. The processing fluid is caused to flow through the orifice while the flow resistance is being monitored. The process is stopped when a target flow resistance has been reached. Rhoades mentions that PTFE (a fluorine-containing coating material) may be used to add lubricating properties to the surface (col.8, lines 5-6). Additionally, Rhoades states that "[f]or electroplating, electroless plating and vapor deposition in applications apropos to the present invention, the workpiece must be held in an apparatus such that **the processing fluid flow is confined to passage through the orifice(s) to be plated or coated and sized**."

Regarding the Examiner's contention that Rhoades discloses the claimed feature of "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice" because "in finishing the entire inner surface of an orifice, the coating

will extend to the edge radius of the outlet of the orifice in which the edge radius of the outlet of the orifice can be considered to be an immediate exterior of an outlet area of the at least one discharge orifice," the Examiner is implicitly relying on the doctrine of inherent disclosure. However, in order to rely on the doctrine of inherent disclosure, Applicants note that the Examiner must provide a "basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristics ***necessarily*** flow from the teachings of the applied art." (See M.P.E.P. § 2112; emphasis in original; see also *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Int'f. 1990)). "Inherency, however, may not be established by probabilities or possibilities," i.e., "mere possibility that a certain thing may result from a give set of circumstance is not sufficient." In re Robertson, 49 U.S.P.Q.2d 1949, 1950-51 (Fed. Cir. 1999). Clearly, the **mere possibility** that the coating may extend to the edge radius of the outlet of the orifice does not necessarily lead to the conclusion that "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice" is, or needs to be, present. Accordingly, the Rhoades reference does not inherently teach the claimed feature of "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice."

For at least the foregoing reasons, it is respectfully submitted that the combination of Nally and Rhoades does not disclose, or even suggest, all of the features of the claim 16. Accordingly, claim 16 and its dependent claims 19 and 21-25 are allowable over the combination of Nally and Rhoades.

Independent of the above, Applicants note that in order for a claim to be rejected under 35 U.S.C. § 103(a), not only must the cited references teach or suggest each element of the claim, but the prior art must also *suggest the desirability* of combining the elements in the manner contemplated by the claim. M.P.E.P. § 2143.01 (citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990). The mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the prior art also suggests the

desirability of the combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).

Applicants respectfully submit that the teachings of Rhoades bear only a tenuous relationship to the presently claimed subject matter. Rhoades describes a method for electroplating the *internal shapes* of an orifice with a precisely controlled layer of material for purposes of controlling flow resistance. The problem of coating the *exterior* of the orifice is completely irrelevant as regards the object of the invention of Rhoades et al., since the exterior shape of an orifice has only a slight effect on the fluid flow rate. In fact, Rhoades only specifically mentions the use of a PTFE coating on the ***interior* surface of the orifice** to improve orifice lubrication, which is directly related to the flow rate. Nally does not mention a coating at all. Accordingly, Applicants submit that there is no motivation for combining the teachings of the applied prior art references in an attempt to arrive at the presently claimed subject matter.

In this respect, the coating of the exterior surface of a fuel injector is not taught or suggested by either Nally or Rhoades, exactly *because* those references do not address any **problems related to the exterior surface**, e.g., the problem of soot deposit on a valve tip. "The test for an implicit showing is what the combined teachings, knowledge of one of ordinary skill in the art, and *the nature of the problem to be solved as a whole* would have suggested to those of ordinary skill in the art." *In re Kotzab,* 217 F.3d 1365, 1370, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000). The problem to be solved by the method of Rhoades is the precise control of the flow resistance through an orifice, which bears essentially no relationship to the presently claimed subject matter.

Applicants further note that in order for a claim to be rejected under 35 U.S.C. § 103(a), a reasonable expectation of success is required. In this regard, even assuming that a practitioner wished to provide the coating by the method described by Rhoades, the method *could not be reasonably expected to be used to coat the exterior surface of an orifice in a desired manner.* As mentioned above, the possibility of deposition of some material around the orifice is only an **accidental** feature of the method of Rhoades and cannot be

controlled with any accuracy. It should be noted that in the method of Rhoades, the process is stopped when a desired flow resistance is reached (claim 1). However, it would be unknown how much, if any, material may have been deposited outside the orifice at the time the process is stopped. It would take an inordinate amount of experimentation to modify the method of Rhoades, which is intended to coat the interior surfaces of an orifice, to coat the exterior surfaces of the orifice in a desired, controlled manner.

For the foregoing reasons, Applicants respectfully submit that the Examiner's asserted combination of Nally and Rhoades is based on improper hindsight reconstruction, rather than on a suggestion from the prior art that is "clear and particular." *In re Dembiczak*, 50 U.S.P.Q.2d 1614 (Fed. Cir. 1999).

For the foregoing reasons, Applicants respectfully submit that claim 16 and its dependent claims 19 and 21-25 are not rendered obvious by the combination of Nally and Rhoades. Reversal of the obviousness rejection of claims 16, 19 and 21-25 is requested.

ii. Arguments Pertaining to Claim 21

Independent of the above, regarding claim 21, Applicants submit that the combination of Nally and Rhoades does not teach or suggest that "the coating is provided in a ring shape around the at least one discharge orifice." In order for a claim to be rejected under 35 U.S.C. § 103(a), a reasonable expectation of success is required. As noted previously, the accidental deposit of material outside the orifice in the method of Rhoades is not controllable, and its shape will be substantially unpredictable, so "a ring shape" cannot be reasonably expected. For at least this reason, claim 21 is not rendered obvious by the combination of Nally and Rhoades.

iii. Arguments Pertaining to Claim 22

Independent of the above, regarding claim 22, Applicants submit that the combination of Nally and Rhoades fails to teach or suggest that "the coating is provided over an entire surface of a downstream exterior surface of

the component." In order for a claim to be rejected under 35 U.S.C. § 103(a), a reasonable expectation of success is required. Clearly, the coating method of Rhoades cannot be adapted to coat an entire exterior surface in a controlled, desired manner without undue experimentation, since the accidental deposit of material outside the orifice in the method of Rhoades is not controllable, and the extent and/or shape of the coating will be substantially unpredictable. For at least this reason, claim 22 is not rendered obvious by the combination of Nally and Rhoades.

B. Rejection of Claim 17 Under 35 U.S.C. § 103(a)

Claim 17 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nally (U.S. Patent No. 5,544,816) in view of Rhoades (U.S. Patent No. 4,995,949), and in further view of Fedorovich (Soviet Union Published Patent Application No. 775364B). Applicants respectfully submit that the rejection of claim 17 in view of the combination of Nally, Rhoades and Fedorovich should be reversed for at least the following reasons.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

Claim 17 depends on claim 16. Furthermore, the combination of Nally and Rhoades does not disclose, or even suggest, all of the features of parent claim 16, e.g., the combination of Nally and Rhoades fails to teach or

suggest the claimed feature of "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice." Fedorovich does not cure the deficiency of the combination of Nally and Rhoades as applied against parent claim 16, i.e., Fedorovich also does not teach or suggest coating of an immediate exterior of an outlet area of the orifice, as recited in parent claim 16.

For the foregoing reasons, it is respectfully submitted that dependent claim 17 is patentable over the combination of Nally, Rhoades and Fedorovich. Reversal of the obviousness rejection of claim 17 is requested.

C. Rejection of Claim 18 Under 35 U.S.C. § 103(a)

Claim 18 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nally (U.S. Patent No. 5,544,816) in view of Rhoades (U.S. Patent No. 4,995,949), and in further view of Otomo (U.S. Patent No. 4,620,995). Applicants respectfully submit that the rejection of claim 18 in view of the combination of Nally, Rhoades and Otomo should be reversed for at least the following reasons.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

Claim 18 depends on claim 16. Furthermore, the combination of Nally and Rhoades does not disclose, or even suggest, all of the features of parent claim 16, e.g., the combination of Nally and Rhoades fails to teach or suggest the claimed feature of "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice." Otomo discloses using a curtain flow method to coat and bake gasket sheet materials to improve their heat resistance. According to Otomo, "[i]n the curtain flow coating method, a sheet of gasket material passes through a curtain-like filmy flow of a predetermined width of the coating agent. Once applied, the coating is then baked in a furnace to form coated films on the surfaces and sheared faces of the gaskets." (Col. 2, lines 4-9). Therefore, Otomo clearly does not cure the deficiency of the combination of Nally and Rhoades as applied against parent claim 16, i.e., Otomo also does not teach or suggest coating of an immediate exterior of an outlet area of the orifice, as recited in parent claim 16. For the foregoing reasons, it is respectfully submitted that claim 18, which depends on claim 16, is not rendered obvious by the combination of Nally, Rhoades and Otomo.

Independent of the above, Applicants note that the Examiner's asserted combination of Nally, Rhoades and Otomo is not supported by the teachings of the applied references or other prior art. In order for a claim to be rejected under 35 U.S.C. § 103(a), a reasonable expectation of success is required. The curtain coating method of Otomo used to coat gaskets with a film of PTFE clearly could not possibly be used, as described by Otomo, without completely sealing the fuel injection valve, thus obstructing the fuel inlet and the orifice. Therefore, the curtain coating method of Otomo could not be practically combined with the method of Rhoades, which starts with an orifice that is substantially oversized or undersized, and the orifice diameter is adjusted while the **processing fluid is caused to flow through the orifice** while the flow resistance is being monitored. Since the asserted combination would change the principle of operation of the prior art invention being modified, the teachings of the applied references are insufficient to render the claims *prima facie* obvious. In re Ratti, 270 F.2d 810, 123 U.S.P.Q. 349

(C.C.P.A. 1959); see also M.P.E.P. 2143.01. Furthermore, since the asserted combination would render the prior art invention being modified unsatisfactory for its intended purpose, there is no suggestion to make the proposed modification. In re Gordon, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984).

For the foregoing reasons, it is respectfully submitted that claim 18 is patentable over the combination of Nally, Rhoades and Otomo. Reversal of the obviousness rejection of claim 18 is requested.

D. Rejection of Claim 20 Under 35 U.S.C. § 103(a)

Claim 20 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nally (U.S. Patent No. 5,544,816) in view of Rhoades (U.S. Patent No. 4,995,949), and in further view of Komaroff (U.S. Patent No. 4,397,283). Applicants respectfully submit that the rejection of claim 18 in view of the combination of Nally, Rhoades and Komaroff should be reversed for at least the following reasons.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

Claim 20 depends on claim 16. Furthermore, the combination of Nally and Rhoades does not disclose, or even suggest, all of the features of parent claim 16, e.g., the combination of Nally and Rhoades fails to teach or

suggest the claimed feature of "a coating around the at least one discharge orifice, including at least in an immediate exterior of an outlet area of the at least one discharge orifice." Komaroff relates to an ignition onset sensor for internal combustion engines, and Komaroff does not cure the deficiency of the combination of Nally and Rhoades as applied against parent claim 16, i.e., Komaroff also does not teach or suggest coating of an immediate exterior of an outlet area of the orifice, as recited in parent claim 16.

For the foregoing reasons, it is respectfully submitted that claim 20, which depends on claim 16, is not rendered obvious by the combination of Nally, Rhoades and Komaroff. Reversal of the obviousness rejection of claim 20 is requested.

IX. CONCLUSION

For the foregoing reasons, it is respectfully submitted that the final rejection of claims 16-25 should be reversed.

Respectfully submitted,

KENYON & KENYON

Dated: 5/10, 2005

By: [signature] (by [signature] R. No. 36,197)

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